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SJTU TODAY

Findings of First Autumn Antarctic Expedition Released

Members of China's 41st Antarctic expedition team and penguins are pictured while China's research icebreakers Xuelong and Xuelong 2 are carrying out unloading operations surrounding Zhongshan Station, a Chinese research base in Antarctica, Dec 8, 2024. [Photo/Xinhua]

In an unprecedented autumn expedition to Antarctica, scientists observed a significant surge in small planktonic organisms in the deep and bottom layers of the ocean, a stark contrast to their typical presence in the upper ocean during spring and summer.

Researchers said the rich, balanced distribution of water properties and planktonic life in the vertical layers of the ocean was especially striking in the polynya area — the "ice-making factory" of Antarctica — located in the Ross Sea.

The findings underscore the profound impact of intense deep convection activities driven by strong ice formation processes in the polynya, an area of unfrozen sea within a large patch of ice, during the cold season. These activities shape the physical properties of seawater and influence biological distribution and overwintering processes, scientists said.

The observations came from the first-ever human expedition to Antarctica in its autumn season, during which researchers collected more than 3,000 chemical analysis samples and 2,500 biological analysis samples. The results were presented by scientists from Shanghai Jiao Tong University at a news briefing on Friday.

During the transition from March to April, when Antarctic productivity sharply declined, about 50 researchers from nine countries — China, the United States, the United Kingdom, Australia, New Zealand, Norway, South Korea, Malaysia and Thailand — braved extreme temperatures from -20 C to -28 C in the autumnal Ross Sea. They conducted continuous observations for 20 days.

Their work was part of China's 41st Antarctic expedition and marked the first multinational collaborative research focused on the autumnal ecosystem of the Antarctic marginal seas. The initiative was led by the School of Oceanography at Shanghai Jiao Tong University and the Polar Research Institute of China.

Zhou Meng, dean of the school and a veteran of 14 Antarctic and 10 Arctic expeditions, highlighted the rarity of Antarctic research beyond the summer season, citing challenges posed by extreme climate and complex marine conditions. The lack of observational data available during autumn and winter meant that there was limited human understanding of natural processes around those seasons, scientists said.

"When we reached Antarctica in early spring during previous expeditions, we saw that 99 percent of the biomass had disappeared, so there always existed this curiosity about what happened in autumn and winter," Zhou said.

The Ross Sea plays a pivotal role in Antarctic studies, serving as a crucial site for the generation of the densest water mass in the Southern Ocean, known as Antarctic Bottom Water.

This region significantly influences global heat and salt circulation and climate patterns, scientists said.

"Moreover, the Ross Sea stands out as one of the most biologically productive areas in the Southern Ocean, boasting abundant marine resources vital for ecosystem functioning," Zhou said. "The high productivity and deep water formation processes make the Ross Sea a hotspot for the burial of organic carbon in the deep sea."

Zhang Zhaoru, assistant chief scientist of the research and a professor at the school, said the deep convection processes in the polynya during the windy autumn period can effectively transport surface ocean particles to deeper layers. This process may play a crucial role in carbon burial, she said.

The team's research also identified warm signals of deep water intrusion and cold signals of ice shelf meltwater in the polynya, processes instrumental in the generation of Antarctic Bottom Water driven by deep ocean convection.

The Xuelong-2 icebreaker. /School of Oceanography, Shanghai Jiao Tong University

Furthermore, the team observed significant differences in nutrient concentrations in the polynya compared with other marine regions, indicating active biological processes before their expedition.

"These unique ecological processes in the polynya area of the Ross Sea provide essential observations for a comprehensive understanding of the biogeochemical cycles in the Antarctic marginal sea," Zhou said.

Scientists said an active "dark ecosystem" exists in the Antarctic marginal sea during the autumn and winter seasons, lasting as long as eight to nine months. This ecosystem encompasses various organisms, including krill, fish, birds and mammals.

"Our discoveries and ongoing explorations will help answer scientific questions: Where do the organic matter and energy driving the marine biosphere in the dark ecosystem of the Antarctic autumn and winter seasons come from? How do processes such as ice formation, deep convection and mixing impact the transport of marine organisms and vertical carbon flux? Which processes in winter determine the population structure of planktonic organisms, influencing productivity in the following spring season?" Zhou said.

The research team said its work enhances the international community's understanding of the adaptation and survival strategies of key biological groups and ecosystems in the challenging dark environment of the Southern Ocean during autumn. The team's efforts also offer valuable experience for future Antarctic expeditions in winter.

(Source: China Daily,CGTN)

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Shanghai Researcher Earns Global Honor for Groundbreaking MRI Technology

A recording of Qiu Yueqi receiving the award

PhD student Qiu Yueqi, of Shanghai Jiao Tong University, received the ISMRM Young Investigator Award for her groundbreaking research in low-field MRI technology at the annual meeting of the International Society for Magnetic Resonance in Medicine in Hawaii.

She is the only recipient of the award this year.

Founded in 1994, the society is the world's largest academic organization dedicated to magnetic resonance technology for medical use.

Qiu is a member of Professor Zhang Zhiyong's research team at the university's School of Biomedical Engineering. The team has developed an innovative SPEN (Spatiotemporal Encoding) method that produces images with less geometric distortion compared to traditional EPI (Echo Planar Imaging) techniques. This approach provides key support for applying portable MRI systems in clinical practice.

Qiu's paper, titled "Spatiotemporal Encoding MRI in a Portable Low Field System," received the Prince-Meaney Translational Science Award, with Professor Zhang the sole corresponding author.

This award is one of three major honors under the ISMRM Young Investigator Award and focuses on translational research in magnetic resonance science. It is awarded to groundbreaking studies worldwide with the highest potential for clinical application.

It is the first time a Chinese researcher has received this award, a significant milestone in China's advancement in core medical equipment technologies.

Qiu is now an active member of the International Society for Magnetic Resonance in Medicine (ISMRM). So far, she has published three first-author papers in leading journals in magnetic resonance.

She and the research team are now exploring broader applications of low-field MRI technology, such as applying portable low-field MRI systems and new imaging techniques in the studies of brain development in children.

It also successfully founded a company last year, focusing on developing patient-centered portable MRI systems, according to an article on the university's website.

The team are to continue their cross-disciplinary work, aiming to integrate SPEN technology with artificial intelligence and precision medicine, further enhancing the diagnostic capabilities of portable MRI systems. Their goal is to improve portable MRI equipment's ability to diagnose diseases early and tailor treatment to each patient.

(By Li Xueqing, Shanghai Daily)

SJTU and PoliMi Hold Joint Ph.D. Program Info Session

On June 3, 2025, Shanghai Jiao Tong University (SJTU) and Politecnico di Milano (PoliMi) held a bilateral information session for their Joint Ph.D. Program at SJTU's Minhang Campus. The hybrid event aimed to further strengthen collaboration in doctoral education and research exchange, and to explore new opportunities for Asia-Europe academic cooperation.

Prof. Daniele Rocchi, Vice Rector and Dean of the Ph.D. School at PoliMi, led the visiting delegation. SJTU representatives included Prof. Tao Deng, Dean of the Graduate School; Prof. Xing Ruan, Dean of the School of Design; Prof. Hui Chang, Vice Dean of the Graduate School; and Prof. Lei Zhu, Vice Dean of the School of Mechanical Engineering.

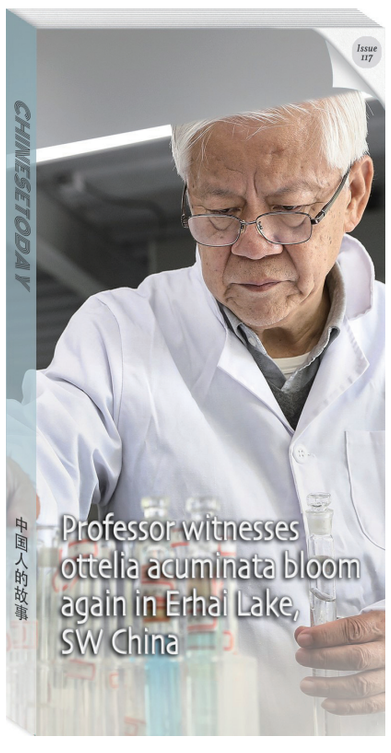
Prof. Deng welcomed the PoliMi team and highlighted the program's role in fostering interdisciplinary, globally oriented researchers through dual supervision and dual degrees. Prof. Andrea Matta joined online, praising the strong partnership and shared vision. Prof. Rocchi reviewed past achievements and detailed PoliMi's program structure.

Professors from both universities shared research progress in mechanical engineering, energy, architecture, and aerospace, encouraging new collaborations. Xiaoxiao Shen, a doctoral student, shared her study-abroad experience. A lively discussion and networking session followed.

During the visit, the PoliMi delegation toured SJTU's State Key Laboratory of Mechanical Engineering and the Sino-Italian Energy Building, and discussed future research ties. So far, over 50 SJTU students have studied at PoliMi, with about half earning dual degrees. Both universities aim to deepen cooperation and cultivate innovative Ph.D. graduates with a global perspective.

(Source:Graduate School)

Professor Kong Witnesses Ottelia Acuiminata Bloom Again in Erhai Lake, SW China



This undated file photo shows Kong Hainan (2nd L) and his team members on a boat in Erhai Lake in southwest China's Yunnan Province. (Shanghai Jiao Tong University/Handout via Xinhua)

This file photo shows Kong Hainan (C, front) and his students on their way to take water samples of Erhai Lake in southwest China's Yunnan Province in November of 2013. (Shanghai Jiao Tong University/Handout via Xinhua)

Kong Hainan is the chair professor and doctoral supervisor with Shanghai Jiao Tong University and head of a major science and technology project of water pollution control and management on Erhai Lake in southwest China's Yunnan Province. He had led a team to work in Yunnan for nearly 20 years to improve the water quality of Erhai Lake.

Ottelia acuminata, known as an indicator of water quality, once bloomed in Erhai Lake. Since the 1990s, due to the deterioration of the water quality of the lake, the plant became hard to be found. Thanks to the efforts of Kong's team and local authorities, the water quality of Erhai Lake has gradually improved, and ottelia acuminata flourished again.

In 2020, Kong retired at the age of 70. He took out his personal savings to initiate a fund to train personnel for the protection of Erhai Lake and to support scientific research on its conservation. In recent years, the artificial cultivation area of ottelia acuminata in Yunnan has reached 3,000 mu (200 hectares), and the plant has become an important vegetable for local people. Shanghai Jiao Tong University also successfully developed the storage and preservation technology of ottelia acuminata, and extended its shelf life to 14 days. The vegetable has now become a popular dish on dining tables in cities outside Yunnan.

(Source:Xinhua)

Highlights from Shanghai Mint Museum Showcased in London





COINect, a special exhibition featuring over 100 sets of coins and medals from the Shanghai Mint Museum, is currently on display at the former Royal Mint in London, running from June 8 to 14. This marks the first time China's minting heritage has been showcased overseas on such a scale.

The exhibition commemorates the 105-year history of the Shanghai Mint. Curated by Dr. Pearl Haoqing Wang, it is organized by the USC-SJTU Institute of Cultural and Creative Industry (ICCI), with support from Brunel Design School and the Shanghai Mint Museum.

Through 105 sets of coins and medals displayed across twelve themed cases, COINect explores coinage as a medium of cultural memory, tracing China's rich history, ecological narratives, technological milestones, and international artistic connections.

The exhibition opens with an intricate twelve-piece zodiac medal series (1998–2010), the first to represent the full cycle. Visitors can view coins featuring China's cultural treasures such as the Great Wall, Terracotta Warriors, the Classical Gardens of Suzhou, and the Forbidden City.

Other series highlight China's inventions and modern achievements – from the compass, gunpowder, and paper to the nation's aerospace programme and high-speed trains.

Natural heritage is also celebrated through coins depicting iconic wildlife like the giant panda, South China tiger, and five national parks. Additional highlights include commemorative coins for the 2008 Summer Olympics and the 2022 Winter Olympics, as well as coins that reflect global cultural ties, honoring Andersen, Turandot, Picasso, Dalí, Mozart, and Bach – figures whose works intersect with Chinese culture.

The exhibition was launched at the Chinese Embassy's new chancery, built on the historic grounds of the former Royal Mint. In his opening remarks, Minister Counsellor Bi Haibo noted the symbolism of the setting: "Two former mints facing each other across rivers – the Thames and Suzhou Creek – offer a vivid metaphor for Sino-British cultural dialogue."

Bi also emphasized the broader significance of the event, linking it to recent international interest in Chinese creativity. "Why is the China story increasingly welcomed around the world? Because China has always stood on the right side of history," he said, citing recent cultural phenomena ranging from tech innovation to viral micro-dramas and collectibles like Labubu.

The exhibition also features the winning designs of the Our Water – UK-China Youth Coin Design Competition, with the top entry to be minted into a commemorative coin.

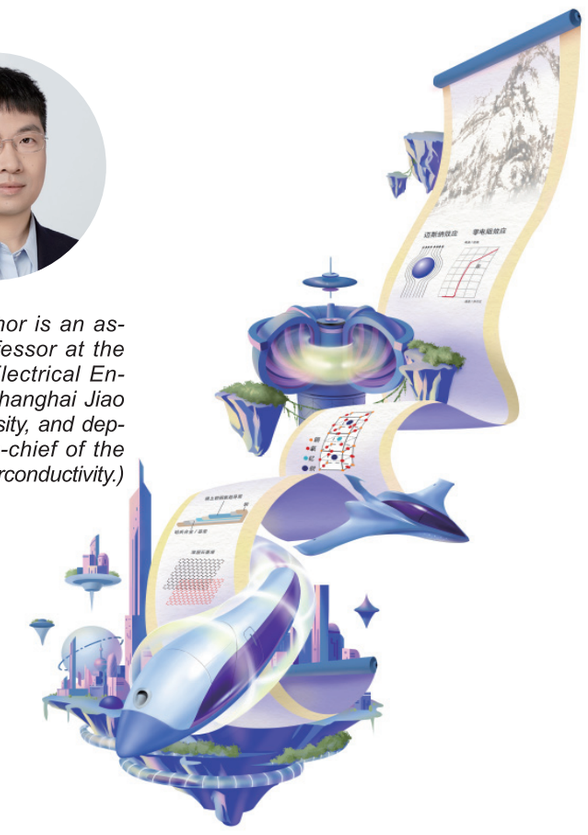
Coinciding with the newly established UN International Day for Dialogue among Civilizations on June 10, the exhibition is hosting two roundtable events: one exploring the evolution of currency and sustainability in the digital era, and another examining the digital preservation of riverside cultural heritage.

COINect is part of Our Water, a cultural exchange program that explores the relationship between water and urban life in Shanghai and other global cities. Following its launch in Paris during the 2024 Summer Olympics, this year's edition focuses on the cultural ties between London and Shanghai, spotlighting the shared heritage of two historic minting sites located on major waterways – the River Thames and Suzhou Creek.

(By Zhao Yinuo,Shanghai Daily)

How Will Superconductivity Change Our Lives?

(The author is an associate professor at the School of Electrical Engineering, Shanghai Jiao Tong University, and deputy editor-in-chief of the journal Superconductivity.)



What might a future shaped by superconductivity look like?

Picture this: in the morning light, cars glide along city roads, their batteries replenished wirelessly in real time by underground superconducting wireless charging system.

Electric aircraft equipped with superconducting propulsion system skim across the river, heading towards distant horizons.

A superconducting maglev train cruises steadily at 1,000 km/h, cutting travel time from Beijing to Shanghai to just over an hour.

As the train leaves the tunnel, vast fields in the Taklamakan Desert come into view, now a high-tech agricultural hub. Hovering above, fusion-powered energy spheres bathe crops in light, transforming what was once barren land into a thriving green oasis.

From the promise of limitless energy through controlled nuclear fusion, to electric aviation, superconductivity, with its extraordinary physical properties, is poised to transform technology and daily life.

Controlled Nuclear Fusion

Controlled nuclear fusion offers a fundamental solution to humanity's energy challenge, making it a top strategic priority for nations worldwide. Among fusion technologies, magnetic confinement fusion using superconducting magnets holds the most promise for practical application. Its core mechanism relies on powerful toroidal magnetic fields generated by superconducting coils to contain ultra-hot plasma within a vacuum chamber, creating a "magnetic cage."

Inside such reactors, extreme temperatures coexist: superconducting magnets require cryogenic conditions below -200°C to maintain their zero-resistance state, while the confined deuterium-tritium plasma burns at over 100 million degrees Celsius, akin to trapping the sun inside a refrigerator. This remains one of the most challenging feats in modern engineering. Recent breakthroughs in high-temperature superconducting (HTS) materials and magnet technology, which generate stronger magnetic fields at higher operational temperatures compared to traditional low-temperature superconductors, are now key to revolutionizing fusion reactors and achieving commercial power generation.

Superconducting Maglev Trains

China's high-speed maglev train (600km/h) is currently in testing and nearing the limits of speed in atmospheric. Superconducting maglev technology levitates the train above its tracks, eliminating mechanical friction. When paired with low-pressure vacuum tubes to reduce air resistance, this creates a "low-vacuum tube maglev transportation system", theoretically enabling speeds exceeding 1,000 km/h, faster than most commercial airplanes. Such "land jets" could turn cross-country commutes between major cities into one-hour trips, redefining regional connectivity.

Electric Aircraft

The shift toward transportation electrification continues, but aviation faces unique hurdles. Aircraft are weight-sensitive, and the power density and lightweighting of electric propulsion systems remain critical bottlenecks. High-temperature superconductors, with current densities over 50 times greater than traditional copper conductors, could dramatically boost the power density of onboard systems like motors, cables, and energy storage, making them the optimal path for electric aviation.

Countries like France, the U.S., and Russia have already begun integrating HTS technology into aircraft electrification. China, too, is advancing research, outlined in its 2019 White Paper on the Development of Electric Aircraft, which envisions a 250-passenger hybrid-electric aircraft with a 3,500 km range. Collaborations between the Chinese Aeronautical Establishment and universities are underway to develop superconducting power systems.

However, a global challenge remains: the lack of efficient superconducting motors and generators has slowed progress. Yet this transition offers China a strategic opportunity. By pioneering megawatt-class high-density superconducting motors and lightweight onboard power systems, combined with expertise in batteries and electric vehicle tech, China could leapfrog traditional aviation paradigms.

Over a century, superconductivity has evolved from laboratory curiosities in liquid helium-cooled coils to a key for overcoming energy loss. With its "zero-resistance" promise, superconductivity is unlocking a future of boundless possibilities.

(By Wang Yawei)

Zhiyuan Honors Program Ph.D. Candidate Achieves Breakthrough in Nature: Innovative Remediation for Complex Organic Pollutants

On May 7, 2025, the esteemed international journal Nature published a groundbreaking research article entitled "Bioremediation of Complex Organic Pollutants by Engineered Vibrio natriegens." This pioneering study presents a novel solution to pressing global environmental challenges, including the discharge of petrochemical wastewater and marine oil spills.

Among the three co-first authors, Cui Haotian, a Ph.D. candidate in the Zhiyuan Honors Program at the School of Life Sciences and Biotechnology, Shanghai Jiao Tong University (SJTU), stands out as the sole student contributor. Joining him are Su Cong, an assistant professor at the Shenzhen Institute of Advanced Technology (SIAT), Chinese Academy of Sciences (CAS), and Wang Weiwei, an associate professor at SJTU. The study was co-led by Prof. Dai Junbiao and Prof. Tang Hongzhi.

Complex organic pollution poses a significant threat to ecological safety. Over time, natural selection and genetic mutation have led to the evolution of microorganisms capable of metabolizing pollutants as a food source. Leveraging these microorganisms' metabolic capabilities offers a cost-effective approach to treating organic pollutants. However, the limited "diet" of existing natural microbial strains, which can only degrade a few types of pollutants, hampers effective bioremediation in real-world scenarios.

To overcome this hurdle, Cui and his research team harnessed synthetic biology techniques to genetically engineer V. natriegens, a microorganism known for its rapid growth and salt stress tolerance. They developed an efficient natural transformation method and an innovative iterative genome editing technology called INTIMATE (Iterative Natural Transformation based on Vmax with Amplified tfoX Effect). This cutting-edge technology enables precise insertion of long DNA sequences into specific genome sites, facilitating continuous strain enhancement and transformation. After multiple rounds of iterative editing, the team successfully created the strain VCOD-15, capable of degrading five typical organic pollutants. Simulated application tests demonstrated that this strain can purify co-existing organic pollutants in saline wastewater from petroleum refineries and chemical plants within two days.

This research marks the successful development of a technical platform for constructing bacterial strains capable of degrading complex organic pollutants. It encompasses the entire process, from designing and synthesizing metabolic pathways to constructing, testing, and applying pollutant-degrading strains in real-world settings. The findings offer biological solutions to global challenges, such as high-salt wastewater treatment. Furthermore, the INTIMATE technology provides a versatile platform for constructing multi-gene cluster engineering chassis. This technology holds promise for extension to other pollutant degradation systems and synthetic biology applications, including natural product synthesis and high-value chemical cell engineering.

Cui Haotian, a member of the 2020 class of Zhiyuan Honors Program Ph.D. candidates, is pursuing a Ph.D. in Bioengineering under the joint supervision of Professor Tang Hongzhi from SJTU and Professor Yizhi Patrick Cai from the University of Manchester.

The Zhiyuan Honors Program has profoundly shaped Cui's research journey. He credits extended courses tailored for Zhiyuan students, and participation in interdisciplinary forums like the "Cross-Disciplinary Innovation" Doctoral Student Forum, for deepening his expertise, broadening his academic horizons, and sparking innovative ideas. The program's unique training approach has been instrumental in his development. The joint mentorship of Professor Tang and Professor Cai, and their commitment to "serving society through scientific research," has guided his topic selection and career planning. Cui aspires to continue researching in the field of synthetic biology post-graduation, contributing to solutions for environmental pollution and food shortages. "The name 'Zhiyuan' signifies 'venturing into the unknown,'" he says. "I aim to honor SJTU's and my supervisors' expectations, exploring uncharted territories and achieving unprecedented accomplishments."

(Source:Graduate School)

Boundless Universe, Methodical Quest for Knowledge Algerian PhD Student Samy's Journey of Chasing Light at the Tsung Dao Lee Institute, Shanghai Jiao Tong University

In the early morning, inside the Tsung Dao Lee Institute at Shanghai Jiao Tong University, Algerian PhD student Samy Kaci is intently staring at his computer screen, analyzing the latest data on ultra-high-energy galactic gamma rays. This young man from North Africa has traveled nearly ten thousand kilometers to China, seeking answers in the study of high-energy particles in the Milky Way. His journey of chasing light epitomizes the journeys of many international students drawn to China's academic opportunities and the Institute's unique appeal.

When it comes to the study life at Tsung Dao Lee Institute, Samy said, "China has an extensive international cooperation network in the field of high-energy physics, and the advancement of its observation equipment and laboratories is truly impressive. The powerful computing capabilities

can effectively assist us in conducting complex data analysis and simulations. Studying at the Tsung Dao Lee Institute means having a larger platform to communicate with academic peers worldwide, as well as more opportunities to showcase my research findings and stay updated with the latest research trends and technological methods at international academic conferences. This has played a crucial role in enhancing my research capabilities and level."

Under the open and innovative research atmosphere of the Tsung Dao Lee Institute, Samy's academic research has also yielded fruitful results. His paper, co-authored with his French mentor Gwenael Giacinti, was published in the top astronomy journal, The Astrophysical Journal Letters (ApJL). In addition, Samy mentioned that he was also committed to seeking cross-field and cross-project cooperation such as the collaboration with the team of the Hailing Project (TRIDENT, TRopIcal DEep-sea Neutrino Telescope) at the Tsung Dao Lee Institute.

Beyond labs, the Institute's weekly "Tea Time" fosters academic discussions. "There is no strict framework to report in the process. Like chatting with friends, everyone is willing to participate," said Samy. "This diverse academic background has gradually enabled me to grow into a researcher with an international perspective."

In 2024, Samy was successfully selected as one of the first batch of "PhD Students in Tsung Dao Lee PhD" in the National High-level Talent Cultivation Center for Physics at Shanghai Jiao Tong University, becoming one of the first recipients of the "Tsung Dao Lee International PhD Scholarship." Receiving this scholarship is a great encouragement for his further research.

For the future, Samy has a clear plan. "After completing my doctoral studies, I will continue to engage in academic research, apply for a postdoctoral position, and eventually become a professor to train more young scholars. I hope to play a greater role in the academic world in the future and cultivate more outstanding research talents."

(Source:Graduate School)